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PROGRAM NUMBER

TWENTY EIGHTH ANNUAL MEETING

OF

THE GEORGIA ACADEMY OF SCIENCE

UNIVERSITY OF GEORGIA

APRIL 27, 28, 1951

UNIVERSITY OF MINNESOTA
APR 30 1951
BIOLOGY LIBRARY

Annual Science Fair: April 27, 9 A. M. to 10 P. M.; April 28, 9 A. M. to 2 P. M.; Emory University, Science Annex A (opposite Emory University Post Office) Clifton Road.

Local arrangements headed by Dr. Harold D. Morris, Assoc. Prof., Agronomy Department, University of Georgia.

BRING THIS PROGRAM WITH YOU TO THE MEETINGS

UNIVERSITY OF GEORGIA
1951
SESQUICENTENNIAL

PROGRAM

FRIDAY, APRIL 27

A. M.

8:30 Meeting of Executive Council, 204 Baldwin Hall

8:30-10:00 Registration and reservations for banquet, Baldwin Hall

10:00-12:30 Section meetings

P. M.

12:30 Luncheon (Places to be announced)

1:30- 2:15 Welcome: President O. C. ADERHOLD, Auditorium, Baldwin Hall

DR. LIANE B. RUSSELL, Oak Ridge National Laboratary. Subject: "The Effect of Radiation on the Prenatal Development of Mammals." Auditorium, Baldwin Hall

2:15- 3:00 Business meeting of the Academy, Auditorium, Baldwin Hall

3:00- 5:30 Section meetings

6:30 Banquet, Snelling Hall, Agricultural Campus. Tickets for Banquet must be bought at time of registration before 10 A. M., $1.75.

Address: DR. W. CONARD FERNELIUS, Pennsylvania State College: "Coordination Compounds in Nature, in Technology, and in Science."

SATURDAY, APRIL 28

A. M.

9:00-12:30 Section meetings

BIOLOGY SECTION

FRIDAY, APRIL 27, 1951

Baldwin Hall 112

Chairman, ARTHUR L. COHEN

A Sterilization Procedure Using Ethylene Oxide

1—9:00-9:15

T. W. KETHLEY, E. L. FINCHER, W. B. COWN, State Engineering Experiment Station, Georgia Institute of Technology

Ethylene oxide, a gas at ordinary temperatures and pressures, has been noted by various workers to possess bactericidal properties. A short summation of the properties of this gas as a bactericide is given. This compound was selected as a sterilizing agent for materials which are thermolabile, using polyethylene films for packaging the objects to be sterilized. Since the bactericidal activity of ethlene oxide in the vapor phase is affected by the relative humidity, it was necessary to construct a suitable chamber in which the relative humidity could be controlled. The explosive nature of the ethylene oxide-air mixtures made it imperative that htis chamber be constructed of non-sparking materials; Plexiglas was chosen for this purpose. The chamber is so arranged that the explosive gas-air mixture can be safely eliminated following the sterilization procedure.

This investigation was supported (in part) by a research grant from the National Institutes of Health, Public Health Service, Washington, D. C.

15 Minutes. Lantern Slides.

Effect of Low Temperatures on the Survival of *Escherichia coli*

2—9:15-9:30

T. W. KETHLEY, E. L. FINCHER, W. B. COWN, State Engineering Experiment Station, Georgia Institute of Technology

A preliminary report of the effect of low temperature on the survival of *Escherichia coli* in aqueous and gelatinuous medium is presented.

Exposure of *E. coli* in an aqueous medium to temperatures of 0° to -12° C. has shown that the crystalline or frozen state of the medium produces a rapid and extensive lethal effect on the bacteria; the subcooled state within the same temperature range is, in contrast, only slightly inimical to bacterial viability over a period of hours.

Greater resistance of bacteria to the crystalline and subcooled state of the surrounding medium has been effected by the addition of small (1%) amounts of gelatin to a buffered aqueous medium. Rates of subcooling previous to crystallization were studied.

An outline of proposed hypotheses explaining the cause of death of bacteria at low temperatures is given. The authors of this paper are of the opinion that the finally accepted explanation of bac-

terial death at low temperatures will be characterized by extreme complexity; its application requiring rigid specification of numerous physical and biological conditions.

This investigation was supported (in part) by a research grant from the National Institutes of Health, Public Health Service, Washington, D. C.

20 Minutes. Lantern Slides.

Heredity of the Caribe-Cuna Moon-Child*

3—9:30-9:45

CLYDE E. KEELER, Georgia State College for Women, Milledgeville, and ALCIBIADES IGLESIAS, Escuela Colman, Ailigandi, San Blas, Panama

The albinistic Moon-child variation occurring in high incidence among the inbred Caribe-Cuna Indians of San Blas, is a syndrome or pleiotropic complex affecting morphology, physiology, and psychosomatic behavior.

Among other alterations, Moon-children have reduced body size, sensitive, hypertrichotic skin, and head hair that is white in infancy but that may darken to golden yellow or even to brown in the adult. The eyes are nystagmatic with irides ranging from blue through amber-centered blue to dark brown. Very rarely the eyes may show a violent tinge. Moon-children are sensitive to colds and skin infections. Moon-children lack hand strength, and general endurance. They have a slow gait and sluggish movements. Ultraviolet spectrum analysis of urine samples appears to confirm the observation that Moon-child males are deficient in sex hormone.

The study of 24 pedigrees that we have collected shows that the Moon-child syndrome is transmitted as a simple recessive, mendelizing characteristic dependent upon the presence of one gene substitution in duplex. Among 60 children that constitute sibships segregating Moon-children, 23 are normal boys, 10 are Moon-child boys, 15 are normal girls, 6 are Moon-child girls, and 6 are normals with sex unknown.

In certain pedigrees the Moon-child gene in simplex produces a complexion that is lighter in shade than the average Indian but is not accompanied by the pleiotropic affects mentioned above.

Several Caribe-Cuna families segregate blonds with green to hazel eyes and light hair. These individuals are not to be confused with Moon-children. They are thought to be descendants of three shipwrecked European sailors who were adopted into the tribe about a century ago.

20 Minutes. 3″ x 4″ color transparency lantern slides.

*Research supported by a grant-in-aid from the Rockefeller Foundation made to the senior author.

Action of Certain Viricidal Agents on Lactic Streptococcus Bacteriophage

4—9:45-10:00

FREDERICK W. BENNETT and F. E. NELSON, University of Georgia

A closed room was infected by atomizing into the air whey filtrates containing three strains of bacteriophage active against *Streptococcus cremoris*. Most of the phage disappeared from the air in 1-2 hours, but some was recovered in certain trials 7-8 hours after dispersal.

Glycols atomized into the air at the rate of 14.6 - 43.8 ml. per 1,000 ft.^{3} simultaneously or at intervals up to 25 min. following infection did not cause any measurable inactivation of the phage. Aerosols of calcium hypochlorite supplying 0.61 g. of available chlorine per 1,000 ft.^{3} of air completely inactivated the air-borne phage within 10 sec. An aerosol supplying 0.7 g. of alkyldimebenzylammonium chloride per 1,000 ft.^{3} failed to inactivate the phage and was intolerable to a person in the room.

When the tests were conducted on bacteriophage suspended in 1:2,10-1 and 10-2 dilutions of whey filtrates at 25 degrees C. 100-1,000 ppm. of the glycols were ineffective. Available chlorine from calcium hypochlorite in concentrations of 25-400 ppm. inactivated the phage at pH 5.0 - 6.9 in 15-300 sec. exposure. Fifty to 1,000 ppm. of alkyldimethylbenzylammonium chloride inactivated the phage at pH 4.8 - 6.6 in 30-120 sec. exposure. The higher concentrations of the viricides were required when the whey was present in the higher concentrations. Available chlorine was less effective as the pH was increased within the range studied. Alkyldimethylbenzylammonium chloride was more effective at the higher levels of pH within the range of pH 4.8 - 6.6.

15 Minutes.

An Important Ornamental Horticultural Plant Disease ("Flowering Dogwood Spot Anthracnose")

5—10:00-10:15

CHARLES H. DRIVER, Emory University

This Anthracnose disease of flowering dogwood, caused by the fungus *Elsinoe corni*, usually occurs on trees along city streets, although leaf symptoms have been observed in remote rural regions. Few to many scattered spherical to elliptical lesions about 1-2 mm in diameter and light tan in color appear on the delicate floral bracts. Leaves of infected plants exhibit numerous anthracnose disease shot spots 1 mm in diameter. Other parts of the plant are affected—petiole. peduncles, and small stems.

This disease, first observed in Savannah, Georgia, in 1939, has been reported in 1950 in epidemic or near-epidemic proportions in Atlanta, Georgia, and Roanoke, Virginia. A promising control measure, reported by Jehle and Jenkins for this disease, consisted of an early spray of Bordeaux Mixture and a later one of equal parts Fermate and Denate.

15 Minutes.

Some Anatomical Evidences of Brain Injury Causing Cerebral Palsy

6—10:15-10:30

10:30 Brief Recess and Business Meeting

11:00-11:30 Some Recent Advances in Biology of Cancer
Dr. R. R. Spencer, Medical Director, National Cancer Institute, National Institutes of Health, Bethesda, Maryland.

II. Advances of Biology

3:00- 3:15 Recent Studies on the Caribe-Cuna and their Moon-children.
DR. CLYDE KEELER, Georgia State College for Women, Milledgeville.

3:15- 3:30 The Development of Reflexes, Posture, and Progression in the Infant Monkey.
DR. MARIAN HINES, Department of Anatomy, Emory University School of Medicine, Emory University, Georgia.

3:30- 3:45 Biology of the Fungi Pathogenic to Man.
DR. LIBERO, U. S. Public Health Service, Chamblee, Georgia.

III. *Teacher's Symposium* Biology and Biological Teaching in the National Emergency

Saturday, April 28

9:30 A.M.

Discussion Leader: Mrs. M. Gordon Brown, Science Coordinator, Atlanta School System

Participants: DR. W. B. BAKER, Emory University, MISS E. LEWIS LIPPS, Shorter College, MR. DON SINGLETERRY, Atlanta School System, and others.

IV. *Brief Paper*

1. A simple respirometer for class use.

ALAN Q. DICKSON and ARTHUR L. COHEN, Oglethorpe University, Georgia.

PSYCHOLOGY AND MEDICINE

SATURDAY MORNING, APRIL 28, 1951

University of Georgia, Baldwin Hall, Room 204

Chairman—Joseph E. Moore

Movement Patterns and Sensitivity in New Born Puppies

1—9:00-9:15

W. T. JAMES and DEORE J. CANNON, The University of Georgia

In a previous report an apparatus was described which has been used in studying the movements of new born puppies. This paper gives some results obtained by the use of this apparatus.

At birth the body of the puppy rests on the stomach with the legs out at the side. Since the fore part of the body is more maneuverable than the rear part, the animal can turn toward the right or left, with the rear of the body acting as pivot. The animal can make turning movements during the first ten days of life better than it can propel forward. There is a tendency for the right-left turn to follow in succession, giving a pattern similar to the S pattern observed in the amblistoma by Coghill. Each right-left turn propels the animal slightly forward. Results will be presented to indicate that this form of movement occurs regardless of whether the head is toward or away from the mother and the other members of the group. Tactile stimuli are important in giving direction to the pattern of movement and modifying it during this early stage. Right-left, and circular movements predominate in trial-and-error fashion until a member of the group is contacted. The pattern then changes into one which follows the object contacted, using the head as a lever against the object to propel the body.

15 Minutes. Slides.

Involuntary Movement and Schizophrena through a Thirty-three Month Period

2—9:15-9:30

AUDLEY C. HARRIS (Introduced by A.S. EDWARDS) The University of Georgia

One hundred seventy-three schizophrenic patients at the Milledgeville State Hospital were measured for finger tremor in 1948. Thirty-three months later it was possible to measure the finger tremor of 124 of these same patients. Summaries of the clinical records made by the attending doctors were reported at both times. A report is made of a comparative study of the clinical records of these 124 patients with the records of finger tremor. Of special interest is the relation of finger tremor to the clinically reported condition of these patients, as improved, no change, no improvement, and deteriorated.

15 Minutes. Slides.

Involuntary Movement as an Index of Motor Stability and Deterioration

3—9:30-9:45

A. S. EDWARDS, The University of Georgia

Data are reported from a large number of experiments to offer the basis for a discussion of the possibility of the measurement of involuntary movement as an index of motor stability and of deterioration. The measurements are of finger tremor. The groups include normal subjects, senescents, seniles, feebleminded, musicians, surgeons, and schizophrenics. The question is raised as to how far an abnormal increase in involuntary movement may be an index of general deterioration.

10 Minutes. Slides.

Results of Testing Congenital Syphilitics with the Wechsler Intelligence Scale for Children

4—9:45-10:00

FLORENE M. YOUNG and VIRGINIA A. PITTS, The University of Georgia

Numerous writers have listed congenital syphilis as a cause of mental deficiency. Actually there is a dearth of scientific research on the problem and investigations are needed.

The present study reports the results of administering an individual test, the Wechsler Intelligence Scale for Children, to 40 juvenile congenital syphilitics and 40 control subjects. The experimental cases were diagnosed as congenital syphilitics by the staff of the Alto Medical Center, Alto, Georgia.

The control subjects were paired with the syphilitic cases on the basis of age, sex, race, geographic region, and paternal occupation. All subjects were Negro rural children living in Georgia. They ranged in age from six to sixteen years, the average age being twelve years.

The group of congenital syphilitics has a mean I.Q. of 59, which would indicate feeblemindedness. The control group also had a low rating, a mean I.Q. of 70. The control subjects surpassed the experimental cases on all eleven sub-tests, and all but three comparisons of sub-test scores resulted in differences which were statistically significant. Congenital syphilis in the children of this investigation is associated with significantly inferior intelligence and with selective impairment of mental functions.

12 Minutes.

10:00-10:15—Recess. 15 Minutes.

Mental Test Performance of Veterans and Certain Industrial Applicants in Georgia

5—10:15-10:30

JOSEPH E. MOORE, Georgia Institute of Technology, and L. W. ROSS, Union Bag and Paper Corporation, Savannah

The scores on the Revised Beta Examination are compared for

two groups of Georgia men. One group of 2,180 men was drawn from those who had gone through the Veterans' Guidance Center at Georgia Tech. The other group was made up of applicants applying for work at The Union Bag and Paper Corporation, Savannah, Georgia. There were 1,996 industrial applicants included in this study.

The data are grouped into grade levels, ages and test scores. Statistical analysis of all comparisons are made.

10 Minutes. Slides.

A Case of Symbolization of Polymorphous Sexuality Culminating in Murder

6—10:30-10:45

L. L. BRYAN, U. S. Public Health Service

Two years ago a 25-year-old colored man with an I.Q. of 133 held a clerical position at the United Nations Headquarters. Upon the occasion of a visit to Washington, D. C., he became intoxicated and visited a prostitute. As they undressed the prostitute was amused to observe that Hugh was wearing feminine underwear.

Hugh first practiced the type of perversion known as "Round-the-World." Second he indulged in normal heterosexual relations. As a third and final act he became abusive and choked his companion to death.

History revealed a severe beating at the age of 8 years when Hugh was discovered in bed with his 5 year old sister. At that time both children were nude, and attempting copulation. They had little to do with each other after the beating.

Hugh has since felt very lonely. He practiced exhibitionism occasionally between 9 and 11. Homosexual conduct (aggressive) started at 12, and may never have been completely overcome.

Drinking began at 16, and was subsequently used in increasing amount to cope with mounting tension. Heterosexual relations have never been possible when sober, but after his 17th birthday he was able to make use of prostitutes when rather heavily intoxicated. During the next six years he made fruitless efforts to render himself attractive to desirable girls. This blocking of his path to a normal sexual adjustment produced feelings of frustration and increased tension.

In each visit to a prostitute he was able, under a type of narcosis produced by alcohol, to symbolize, in the order named, the three dominant emotions of his cultural background, Viz:

1. By using prostitute as a sister-substitute he expressed his feeling of guilt, and also his sympathy for his sister whom he had caused to receive the beating at age of 5 years.

2. Normal intercourse symbolized the fulfillment of his wish for a socially-acceptable adjustment. Companion was used as substitute for a wife.

3. By abusive treatment he revealed his resentment at all women who had scorned his love.

Explanation of psychodynamics, followed by advice and encouragement constituted only treatment needed to relieve emotional tension.

Brief Analysis of the Predictive Value of the A. C. E. English Test for Academic Achievement

7—10:45-11:00

EURI BELLE BOLTON, Georgia State College for Women

This is a continuation of the study of the predictive value for academic achievement of the placement tests given to entering freshmen at the Georgia State College for Women. The hypotheses considered are: (1) that the abilities measured by the A.C.E. English tests are predicted better by the A.C.E. Psychological Examination than by the Otis Quick-Scoring Test of Mental Ability; (2) that the A.C.E. Speed of Reading Test has the least value for predicting academic achievement of any of the tests in the A.C.E. English battery of tests; and (3) that a good test of knowledge of vocabulary has very good value for predicting general academic achievement whereas a speed of reading test has very little value for predicting academic achievement.

The total number of quality points earned each quarter of the freshman year and during the first year in college has been used as the criterion of academic achievement. Total, partial and multiple correlations and the efficiency of prediction score suggested by Hull have been used in analyzing the data.

The results obtained give positive evidence for the support of the hypotheses considered in this analysis.

15 Minutes.

Some Anatomical Evidences of Brain Injury Causing Cerebral Palsy

8—11:00-11:15

EMILY BARRY WALKER, Emory University School of Dentistry

This study was made in the anatomy laboratory of the Emory University School of Dentistry. The subject was the cadaver of a paraplegic colored boy, sent in from one of the state institutions.

A careful dissection was made of the undeveloped muscles, the nerves, arteries and veins. Some interesting anomalies were noted and will be demonstrated. The muscles of the upper limbs were rather well developed, while the lower leg muscles showed definite evidence of failure in development, being mere fibrous strings.

The brain itself presented the best evidence as there was indication of pial hemorrhage and atrophy and lesions in the area of Rolandi. Broca's area also indicated portions of injury.

Investigation of the case history revealed that the individual had a definite speech defect as well as other difficulties resulting from such injuries.

The brain injury areas gave evidence of the type of physical handicap which is usually associated with what is known as Cerebral Palsy.

The paper will be illustrated with kodachrome slides made from the material during the progress of the work.

15 Minutes. Kodachrome Slides.

A Genetic and Metabolic Study of Alkaptonuria in a Large Family

9—11:15-11:30

W. KNOWLTON HALL, KATRINE RAWLS HAWKINS and V. P. SYDENSTRICKER, Medical College of Georgia, Augusta

Sixteen cases of alkaptonuria were found in a locality in Georgia. Fifteen of these were found among some 300 people investigated from a large kindred which was traced for seven generations. The other case was in another apparently unrelated line. In general the character seemed to be a simple recessive. Arthritis and ochronosis were associated with the alkaptonuria in three cases and arthritis alone in two. The excretion of metabolites in the urine has been studied for several of the individuals with alkaptonuria and the pattern of urinary excretion established.

20 Minutes. 2″ x 2″ Kodachrome Slides.

Variations in Selected Performances of College Freshmen According to Three Categories of Rural-Urban Residence

10—11:30-11:45

JAMES E. GREENE, WILMA B. SANDERS, R. T. OSBORNE, University of Georgia

This study purports to analyze the extent, and reliability of differences among college students of rural, urban, and mixed backgrounds with respect to scores on selected standardized tests, college marks, and related variables. Inter-group comparisons for both men and women based on the three categories of residence were made for the University of Georgia freshman class, fall quarter, 1950 (373 men and 210 women). Detailed analyses of the findings will be presented. In general, the urban groups tend to excel the mixed and rural groups in most comparisons. Implications of the findings will be discussed.

15 Minutes.

CHEMISTRY

FRIDAY MORNING, APRIL 27, 1951

Baldwin Hall, Room 307

Symposium on the Teaching of General College Chemistry

9:00

Introduction—J. C. Simms, North Georgia College
Objectives—H. T. Coggins, University of Georgia
Texts and Manuals—A. W. Scott, University of Georgia
Laboratory Work—W. J. Frierson, Agnes Scott College
Content—L. W. Blitch, Emory University
Grading—J. F. Vincent, G.S.C.W.
Tests—A. W. Scott, University of Georgia
Sectioning, Recruiting Majors—W. M. Spicer, Georgia Institute of Technology

3:00-3:15

1. The Enolizing and Reducing Action of Grignard-Type Regents.
   James C. Cox, Jr., Wesleyan College
   15 Minutes. Slides

3:15-3:30

2. The Glycogen Content of Guinea Pig Adrenals.
   Nancy Lee Noble and Evangeline Papageorge, Emory University
   15 Minutes. Slides

3:30-3:40

3. A New Qualitative Separation for Bismuth Ions.
   C. J. Brockman, University of Georgia
   10 Minutes

3:40-4:00

4. Undergraduate Research Projects in Qualitative Analysis.
   Bruce McDuffie, Emory University
   20 Minutes

4:00-4:15

5. Analysis of Lanthanum and Cerium Metals by Ion Exchange.
   F. W. Lafond and W. T. Ziegler, Georgia Institute of Technology
   15 Minutes Slides

4:15-4:35

6. Carbon-14 Tracer Studies in the Rearrangement of Unsymmetrical Benzils.
   Marion T. Clark and O. Kenton Neville, Emory University and Oak Ridge
   20 Minutes Slides

4:35-4:45

7. The Action of Silver Picrate on Alkyl Halides.
   G. E. Philbrook and D. J. Massey, University of Georgia
   10 Minutes

4:45-4:55

8. Potassium Persulfate as a Qualitative Reagent for Cobalt.
   C. J. Brockman, University of Georgia
   10 Minutes

9—4:55-5:10

Contributions of Microwave Spectroscopy to the Theory of the Chemical Bond

J. H. GOLDSTEIN, (Introduced by R. T. LAGEMANN) Dept. of Chemistry, Emory University

For most molecules the difficulties of complete solution of the wave mechanical problem of the valence bond is so great as to necessitate use of a semi-empirical theory involving as parameters the fractional contributions of single and multiple bonds, ionic forms, the amount and type of hybridization, etc. These parameters are determined from such experimental quantities as bond lengths and dipole moments. The accuracy with which these quantities can be determined imposes one of the chief limitations to such a theory.

Moments of inertia determined from microwave spectroscopic results have improved bond distance values by an order of magnitude, permitting a corresponding refinement in bond theory. Dipole moment values by the same technique have not only been improved in some cases but also possess the advantage of being determinable for a given vibrational state, and in some cases in excited vibrational states. These features have not been exploited to any great extent.

The most important contribution to bond theory has resulted from utilization of the data obtained from the hyperfine structure of pure rotational spectra. Nuclei are not point charges in fact and, if sufficiently unsymmetrical, prove to be very sensitive to unsymmetrical charge distributions in their immediate vicinity. This fact has led to entirely new developments, as well as mere refinements, in bond theory.

Other closely related experimental techniques give promise of future advances. Molecular Zeeman effects involve in principle the effect of molecular rotation on electron distributions. Another new development consists in observing direct transitions between hyperfine levels, which may indicate how chemical bonds in a condensed phase differs from those in the free gaseous molecule. In both these fields, only a handful of papers have appeared.

15 Minutes Slides

GEOLOGY, GEOGRAPHY AND RELATED FIELDS

FRIDAY, APRIL 27, 1951

LeConte Hall, 209

Chairman, A. S. FURCRON

1—9:00-9:15

Engineering Properties of Georgia Soils

GEORGE F. SOWERS, Civil Engineering Department, Georgia Institute of Technology

The civil engineer is vitally concerned with two aspects of soils. First, the characteristics of the undisturbed soil deposit, and second, the properties of soils affecting their uses as materials of construc-

tion. The former is of importance in designing foundations for construction of fills, subgrades for highways and air fields, and bridges, buildings, and dams, and the latter is important in the earth dams and levees.

The soils of northwest Georgia are thin and fairly well consolidated. They usually do not present many difficulties for foundation design. They can be compacted easily in construction, but are somewhat sensitive to changes in moisture content.

The Piedmont soils are deep, and consist of erratic bands of micaceous silty sands and sandy silts derived from the decomposition of crystalline rocks. They are somewhat compressible, depending on their mica content, and cause serious settlement problems for the designer. The soils are too micaceous and spongy to be ideal materials for fill and subgrade construction, and are sensitive to moisture content changes.

The Coastal Plain region (except for the coast itself) is underlain by alternate strata of dense sands and stiff clays. The only foundation problems arise from the many local soft spots produced by recent stream deposits and occasional swamps. Excellent fill materials are available throughout this area in the form of sands and clays of low plasticity.

The coast is characterized by broad marshes underlain by extremely soft clays. Occasional sand bars and spits form the high ground. The marshes create very difficult foundation problems, since the soils are weak and compressible, but the sands provide good foundations. The sands make excellent materials for construction.

15 Minutes

2—9:15-9:30

Porcelain Enamel Ground Coats

D. W. GATES, Georgia Institute of Technology

This paper is a survey of the experimental data in the development of a porcelain enamel brown gound coat for sheet metal.

Variations were made in the content of four of the metallic constituents which contribute to adherence. Discussed are such qualities as color, gloss, adherence, and acid resistance.

15 Minutes

3—9:30-9:40

Mold Wear and Quality Control in the Glass Plant

GEORGIA E. SPRING, Georgia Institute of Technology

The portioning of the volume of a pressureware mold into weight and contained volume of a bottle; the effect on volume that changes in weight have; and the effect of mold wear on the total volume of the mold are discussed.

The effect of mold cleaning systems on the total volume of the mold is discussed. The limits and possibilities of quality control is correlated with the foregoing.

The importance of actual volume of a new mold in quality control is pointed out.

10 Minutes

4—9:40-9:55

Electrical Well Logs

CHARLES C. OSTRANDER and THOMAS E. WARMACK, Georgia Institute of Technology

This paper deals with the uses of the electrical well log in the petroleum industry, the theory, and the interpretation of the electrical well log.

The qualitative relationship of resistivity to such factors as the salinity of the fluid, the temperature of the rock formation, and the type of rock formation is discussed.

The electrofiltration and the electrochemical aspects of spontaneous potentials are discussed qualitatively.

As an example, a plausible interpretation is given for an imaginary electrical log.

15 Minutes

5—9:55-10:10

Lithia Substitution in MgO-Al_2O_3-SiO_2 Ceramic Bodies Utilizing Electric Arc-Resisting Furnace Products

STEWART W. McCORMICK, Georgia Institute of Technology

A composition was chosen which, from previous study, had been found suitable for the production of cordierite in an arm furnace. Investigations were then made to ascertain any phenomena of interest occasioned by the lithia substitution for magnesia in the chosen composition. Results indicated this substitution changed the crystal structure from cordierite to that of beta-spodumene.

15 Minutes

6—10:10-10:20

Some Georgia Carolina Bays

H. W. STRALEY, III, Georgia Institute of Technology

The writer examined a group of depressions in Burke County, Georgia, both topographically and geophysically. He concludes that these "wet-weather ponds" have the same characteristics as have been ascribed to the controversial Carolina bays.

6 Minutes

7—10:20-10:40

The Stone Mountain and Lithonia Plutons

A. T. NAVARRE, Georgia Institute of Technology

A rather detailed survey over the Lithonia area was made which presents evidence that what has been called the Lithonia gneiss is in reality, a hybrid rock, which can be classified as a migmatite.

The migmatitic occurrences are all of a batholithic proportion and show concordant as well as discordant contacts with the cover rocks. Xenoliths of assimilated and unassimilated material occur.

In the Lithonia area, a deep-seated magmatic injection brought about a pasty viscous mass, in which slices of the country rock were caught by the upward movement, so that the foliation planes as well as the slivers of mineralized zones assume a nearly vertical attitude.

Anatectic assimilation between the two fusion zones indicates a reaction mixture in which the presence or absence of certain ions played an important part.

Large crystals of microcline and sheets of biotite enveloped in the contorted migmatite point to a tearing loose of large aggregates of a crystallized granite magma at depth and forcing them rapidly upward in the pasty mass.

Pink garnet, black tourmaline and molydenite are common to both the Stone Mountain and Lithonia intrusives. Much smoky quartz containing molybdenum (as shown by the spectroscope) occurs in the Pine Mountain quarries and adjacent regions. The presence of traces of silver with the banded pink garnet zones indicate that this garnet is of pyrogenetic origin and is not a stress mineral as claimed by many. Pyrrhotite accompanied by pyrite lies in shear zones on Pine Mountain and in the Coffey quarries at Arabia Mountain.

Apophyllite occurs rather abundantly at some points in the Coffey quarries. Arsenopyrite is found only in the Coffey quarries where it occurs in well developed orthorhombic crystals measuring about 1″ x ⅛″ in cross section.

Purplish fuorite is found in certain pegmatites near the banded garnet zones. It is not plentiful in any one place, but is more widespread than generally believed.

All quarries from Arabia Mountain to the Grit Quarry carry a considerable amount of carbonates (ankerite, sidero-magnesite) but no calcite has as yet been found. Other minerals will be discussed in both the Stone Mountain and Lithonia plutons.

A horizontal displacement showing a slickenside surface and lined with yellow damourite appears on Stone Mountain and also in the Lithonia Migmatite. A vertical displacement of greater magnitude with a steep dip along the fault plane, and marked by a dark "charred" surface indicates considerable settling within the mass after complete consolidation was effected.

20 Minutes

8—10:40-11:00

Heavy Minerals in Rock Differentiation

VERNON J. HURST, University of Georgia

Certain heavy minerals commonly distributed in small quantities through rocks are relatively little changed by weathering. These are the so-called "indestructible" minerals. As rocks in which they occur undergo the losses in volume attending saprolitization, the proportions of these minerals in a given volume increase; the proportional relationships *between* the heavy minerals, however, are not disturbed. Heavy minerals are the one unchanged feature in saprolite relating it to the original rock.

To test the applicability of this idea, 41 saprolite samples were collected from scattered but selected outcrops in the Athens area. Outcrops were selected so that the identity of the materials at each collection point could be accurately determined. Samples were

panned to obtain concentrates which were then passed through a bromoform separation to remove the remaining light minerals. The heavy minerals were identified with the petrographic microscope, after which composition graphs were constructed for the concentrates.

This procedure made possible a comparison of the heavy mineral assemblages of the different rocks. Two points were established: (1) each rock type in the Athens area contains a characteristic and distinct assemblage of heavy minerals; and (2) the distribution of heavy minerals is sufficiently uniform to warrant their use as differentiation criteria.

Additional saprolite samples were collected from scattered points adjacent to the Athens area and also along a line traversing the Crystalline Belt from Augusta to Atlanta. These samples were studied to determine in a general way range of applicability of differentiation procedures using heavy minerals.

Data from the second group of samples are not regarded as conclusive, since fewer samples were collected from a much larger area. The results, however, strongly suggest that:

(1) the deeply-weathered crystalline rocks in Georgia, which are often indistinguishable by the usual criteria, can be distinguished by their heavy minerals;
(2) some contacts between main rock units which heretofore have been hard to trace may now be followed with comparative ease by superficial analysis of saprolite;
(3) it may be possible to determine age relationships between some of the granites by heavy mineral studies.

15 Minutes 2 x 2 slides

9—11:00-11:15

Age Measurements on Decomposed Flint

A. R. KELLY, University of Georgia

Prehistoric flint tools have been found at several sites in Georgia suggesting a much greater antiquity for these specimens. Earlier attempts to measure the degree of flint decomposition on selected collections of archaeological materials at Macon, Georgia, failed of definite results because of many variable factors found to operate in the process of chemical alteration of the flints.

Recent discoveries of a prehistoric flint quarry and campsite at Lane Springs in northern Decatur county, southwestern Georgia, with flints uncovered that are typologically ancient and heavily decomposed, have revived interest in the problem of studying age conditions in decomposing worked flint.

At Kolomokik Mounds State Park, Blakely, Georgia, decomposed flints are found which exhibit two periods of workmanship; the specimens appear to have been worked in "pre-pottery" times, and later by the mound-builders responsible for the main period of cultural activity at the site.

Given the same flints, altering through time in the same soil, favorable "laboratory conditions" are theoretically present, permitting quantitative measurements on older and more recently worked surfaces, yielding by simple algebraic equations a *minimum* age for the older and initial working of the flint. Assumption of simple linearity of process is probably not justified; correction for retarda-

tion at later periods arrived at by geo-chemical research would tend to increase the dates arrived at by assumptions of linearity.
20 Minutes

10—11:15-11:30

A Preliminary Investigation of the Geology of Clarke County, Georgia

ELDON J. PARIZEK, University of Georgia

A more detailed impression of the general geology of Clarke County, Georgia, has resulted from recent field reconnaissance. Approximate boundaries of a partially exposed granite pluton (batholith?) were traced, in addition to the acquisition of related field information. Four distinct lithologic units are exposed: (1) medium to coarse-grained muscovite-biotite granite, (2) massive, highly-foliated, biotite granite gneiss, (3) distorted, crumbled, easily weathered, border-phase granite, and (4) foliated mica-schist (Carolina Series).

Widely scattered exposures display sharply defined xenolith inclusions. A map of them shows a roughly circular orientation pattern. This would suggest that the granite body of this area is pinnacle-shaped near its summit.

Dike and lit-par-lit pegmatites are common to the marginal and extra-marginal portions of the pluton. Several localities show proof of thorough soaking with late-stage fluids and gases. Coarsely-crystalline quartz veins are closely associated with the pegmatities. Blocks and weathered fragments of the vein quartz are indicative of the granite-chist contact zone. Mineralogically basic dike described and postulated by others as Triassic (?) have been identified.

A definite relation is considered to exist between fracture planes, lineation, and foliation, although detailed work will be necessary before positive information can be given.

Age of the pluton and its equivalence to other exposed granitic bodies of the Georgia Piedmont are unknown. The country rock (biotite schist) has previously been identified as the Carolina Series of probable Pre-Cambrian age.

A number of problems have come to light during the investigation which are presented in the text of the paper.

15 Minutes 2 x 2 slides

11—11:30-11:45

New Evaporation Maps of Northeast Venezuela

JAMES F. LAHEY, University of Georgia

There is currently in progress at the University of Georgia an analysis of the weather and climate of northern South America. Within this area are found extreme differences in various of the climatic elements—of these, the climatic element showing greatest extremes over short distances is precipitation. New maps showing the extreme variability of precipitation over northern South America have recently been published. The maps here presented—a series of evaporation maps—are complementary to the newly published pre-

cipitation maps. Extreme regional differences are noted in evaporation as well as precipitation; with the relationship between evaporation and precipitation totals being an inverse one.

Forty-five meteorological stations in the northernmost portion of the country of Venezuela make evaporation measurements. From these data the series of monthly (Jan., April, July and Oct.), evaporation maps and the annual evaporation map have been constructed.

When the average annual evaporation map is compared with the average rainfall map it is seen that areas with over 1500 mm. of rainfall annually as a rule have much less than 1000 mm. of evaporation yearly while areas with yearly precipitation totals of approximately 500 mm. have over 2000 mm. of evaporation yearly. This clearly illustrates the principle "the smaller the precipitation the higher the evaporation; the higher the precipitation the smaller the evaporation." The amount of precipitation and the amount of evaporation are both undoubtedly related to a third series of casual factors.

These new evaporation maps based on only recently published data provide a parallel climatological map series to recently published rainfall maps of the same area.

10 Minutes Slides 2″ x 2″ Color

12—11:45-12:00

Relation of Stratigraphy and Structure to Origin of the North Georgia Highland

A. S. FURCRON, Georgia Geological Survey

The character and southern extent of the Great Smoky and Blue Ridge provinces in Georgia are directly related to physical resistance of exposed crystalline rocks. This paper outlines the structural and stratigraphic features of these rocks, which lead to the sudden termination southward of the Georgia Highland.

10 Minutes Standard lantern slides

PHYSICS, MATHEMATICS, ENGINEERING AND RELATED FIELDS

FRIDAY MORNING, APRIL 27, 1951

LeConte Hall, 309

PHYSICS

Chairman, R. T. LAGEMANN

1—9:00-9:10

The Infrared Absorption Spectrum of Crystalline Sodium Nitrate

ROBERT LAGEMANN, Emory University

The absorption of solid sodium nitrate has been determined from 1-15 microns by use of two Perkin-Elmer prism spectrometers, one

a double beam model. In addition to confirming portions of previous work, there was found a considerable number of new bands, particularly in the overtone region where single crystals up to 2 cm. in thickness were used. The absorption frequencies have been correlated with the vibration modes of the molecule assuming the model indicated by x-ray diffraction. In the spectral region studied, all the bands may be interpreted in terms of four fundamental vibrations of the NO_3 group which is coplanar.

10 Minutes Slides

2—9:10-9:20

Examination of Selenite and Certain Micas with Polarized and Unpolarized Infra-Red Radiation

RICHARD B. BELSER (Introduced by R. T. LAGEMANN), Georgia Institute of Technology

The infra-red absorption spectra of nineteen samples of mica and related minerals have been examined and plotted. Changes in the absorption spectra of muscovite were obtained by the use of polarized radiation and by tilting the crystal in the beam.

The infra-red absorption spectra of selenite has been studied by the use of polarized and unpolarized radiation.

Comparison of mica spectra with those previously published revealed a number of new bands. Effects of tilt and polarization were small. The evidence obtained indicates that the O-H bonds in mica must be either at angles of approximately ninety degrees to each other, or randomly scattered throughout the crystalline structure.

Examination of the infra-red absorption spectra of selenite with unpolarized radiation revealed a number of hitherto unreported bands. Examination with polarized radiation revealed doublets in the case of two bands previously reported as singlets in the positions 4.6 and 6.1 microns. Apparent shifting of the 4.6 micron band, reported by Koenigsberger in the case of polarized radiation, was found to be due to the change in absorption of the doublet band at 4.55 microns with respect to its partner at 4.68 microns. A series of absorption bands at 2.15, 3.60, and 6.5 microns was found, and is believed to be a fundamental at 6.5 microns and two overtones due to the sulphate radical. Bands at 1.90, 2.45, and 4.53 microns are thought to compose a second series due to this radical.

10 Minutes Slides: 3¼ x 4¼

3—9:30-9:45

The Absorption Spectrum of Nitryl Chloride

W. H. EBERHART and R. J. ATHEY, Georgia Institute of Technology

The near ultraviolet absorption spectrum of nitryl chloride forms a smooth continuum commencing about 3300 A and increasing in intensity towards the ultraviolet. This spectrum is believed to arise from a transition to an unstable excited state dissociating into an excited state of NO_2 and a normal Cl atom at an energy of 3.75 e.v.

above the ground state. This existence of this state is consistent with the energy of formation of the molecule reported recently on the basis of kinetic studies.

The infrared spectrum has been studied in the range from 2 to 15 microns and several new bands observed. On the assumption that the molecule is planar with symmetry C_{2v} a tentative frequency assignment has been made and a normal coordinate analysis has lead to reasonable values for the force constants and geometrical structure.

15 Minutes Two Slides

4—9:45-10:05

Infrared Studies of Hindered Phenols

DR. WILLIAM C. SEARS (Introduced by R. T. LAGEMANN) Dept. of Physics, University of Georgia

Twenty-nine phenols, twenty-two of which contained methyl, t-butyl, tt-octyl and isobornyl groups as ortho stubstituents, were examined for degrees of hydrogen bonding by means of infrared spectroscopy. Hydrogen bonding indices were assigned to the various phenols to indicate their relative tendencies to associate in liquid phase. It was found that the isobornyl group, a secondary alkyl group, hindered more than methyl but less than the tertiary alkyl groups, of which tt-octyl hindered to a slightly greater extent than t-butyl.

The effect of change of phase was investigated; O-H bands for the crystalline state included anomalies such that valid comparisons among phenols required measurements on the liquid phase.

An example of intramolecular hydrogen bonding with formation of an eight-membered chelation ring is pointed out.

On the basis of its observed hydrogen bonding index, a monoisobornyl-phenol of m. p. 77.8-78.6° was found to be 2-isobornylphenol.

20 Minutes 13 Slides

5—10:05-10:25

Absorption Spectra of the Xylene Vapors in the Near Ultraviolet

C. DEWEY COOPER (Introduced by R. T. LAGEMANN), Physics Dept., University of Georgia

The xylenes were studied using a 3 meter grating spectograph and quartz absorption cells of different lengths. Discrete absorption occurs in the region between 2850 and 2375 A° for all three compounds. The ortho xylene spectrum is the sharpest of the three and the riches in bands while the meta xylene spectrum has the least number of bands and the most diffuse appearance. Rough intensity measurements indicate that the para spectrum is about three times as strong as the meta or ortho spectrum. The electronic transition is allowed for each isomer. The O,O bands are located for para at 36733 cm-1, for meta at 36955 cm-1, and for ortho at 37308 cm-1.

Upper state frequencies of the allowed portion of the spectrum which have been identified are as follows: 1185, 995, and 939 and

1195 cm-1 represent totally symmetric carbon ring vibrations in the para, meta and ortho spectrum, respectively; the totally symmetric C-CH_3 valence vibrations for the para, meta and ortho isomers are found to have the respective frequencies 775, 735 and 692 cm-1; the totally symmetric component of the degenerate 606 Eg+ benzene vibration has been found to have the values 367, 470 and 507 in the para, meta and ortho spectrum, respectively. Only in para xylene could a so-called forbidden portion of the spectrum be identified with certainty.

In addition to the absorption bands reported here, the majority of the Tesla luminescence bands of para and meta xylene, which were reported in 1925 by Marsh, are now explainable.

20 Minutes 3 Slides

6—10:25-10:45

The Microwave Absorption Spectrum of Oxygen at Low Pressures

J. H. BURKHALTER (Introduced by R. T. LAGEMANN), Physics Department, University of Georgia

By means of a Zeeman modulation microwave spectrograph, 25 absorption lines of oxygen in the 5 mm. region have been measured. These lines result from the re-orientation of the electron spin of the molecule relative to the end over end rotation of the molecule. Schlapp's formulae for the frequencies of these lines are found to be inadequate, and experimental versions of these formulae are presented. The line width parameter detla nu was also observed for three of these lines.

20 Minutes Slides

7—10:45-11:00

The Emory University Microwave Spectroscope and its Use in the Study of the Deuterated Methyl Halides*

JAMES W. SIMMONS, Emory University

The microwave spectroscope at Emory University covering the wavelength range from 7.05 to 14.2 mm will be described along with the associated frequency measuring equipment. This apparatus has been used to measure the frequencies of the hyperfine structure lines of the pure rotational absorption transitions $J = 0 \rightarrow 1$ for CD_3Cl and $J = 1 \rightarrow 2$ for CD_3Br and CD_3I, all in the ground vibrational state, falling in the frequency region from about 21,000 mc/sec to 31,000 mc/sec. The quadrupole coupling coefficient, eqQ, for each of the halides is slightly less than its value in the corresponding normal methyl halide and the average C-D bond length in each deuterated molecule is somewhat shorter than the corresponding C-H bond length in the normal methyl halide.

*Work supported by a Frederick Gardner Cottrell grant and by the University Center in Georgia.

MATHEMATICS

SATURDAY, APRIL 28, 1951

LeConte Hall 309

Chairman: DAVID F. BARROW

1—9:00-9:15

Matrices Whose Powers Are Matric Polynomials

GERALD B. HUFF, University of Georgia

Let k be a field of characterization $p = 0$ and A be an m-rowed square matrix with elements in k. There may exist m-rowed square matrices $B_n, B_{n-1}, \ldots, B_1, B_0$ which determine a matric polynomial $F(x) = B_n x^n + B_{n-1} x^{n-1} + \ldots + B_1 x + B_0$ such that for each whole number t,

$$A^t = B_n t^n + B_{n-1} t^{n-1} + \ldots + B_1 t + B_0 .$$

If this is true, A^t is said to be a matric polynomial in t. It is proved that A^t is a matric polynomial of degree n in t if and only if $(A - 1)^n = 0$ and $(A - 1)^{n+1} = 0$. Moreover, the matric polynomial $F(x)$ is unique if it exists. Applications are made to problems in geometry.

15 Minutes

2—9:15-9:30

A Generalization of the Jacobi Polynomials Orthogonal on a Finite Set of Points

ROBERT J. LEVIT, University of Georgia

The Legendre, Hermite, and Laguerre polynominals are limiting cases of certain finite systems of polynominals which satisfy orthogonality conditions expressed in terms of finite sums (references in G. Szego, *Orthogonal Polynomials.* (Amer. Math. Soc. Colloq. Pub. Vol. 23, Sections 2.8, 2.9). In the present paper a system J of polynomials is defined which in a similar sense constitutes a finite generalization of the Jacobi Polynomials for certain values of the parameters involved. For certain other values of the parameters the plynomials of J continue to form an orthogonal system although the limiting case no longer exists. For some of these values they exhibit the peculiarity of being orthogonal on two distinct sets of points with respect to the same weight function. The usual properties of orthogonal system such as a recurrence relation, formula of Rodriques' type, etc. are developed.

15 Minutes

3—9:30-9:45

A Solution of Differential Equation

TOMLINSON FORT, University of Georgia

Professor Fort's paper discusses the meaning of the term "solution of a differential equation." He points out the failure of many

authors of books on differential equations to give any definition at all. The inconsistencies that follow such a procedure are numerous. Professor Fort gives a precise definition and proceeds to show just what is included under the given definition. Many interesting and valuable solutions appear that usually are completely overlooked.

15 Minutes

4—9:45-10:00

On Perfect Numbers

JOHN C. CURRIE, Georgia Institute of Technology

A perfect number is an integer which is equal to the sum of its proper divisors; for example, 6 and 28 are perfect numbers. The study of these numbers has intrigued mathematicians, both amateur and professional, for thousands of years. This paper presents an expository and historical account of the investigation and a statement of the present status of information on perfect numbers.

15 Minutes

5—10:00-10:15

Re: Mathematical Law in Measurement of (radiometer) Radiant Energy

NOAH R. BRYAN, Clemson College

This digest begins naturally, with experiments by Sir William Crookes (proc. R. Soc., 1874). He was the first to make systematic experiments. Some of his findings: rotation as related to intensity of radiation, to forces opposing motion, to the friction of the pivot. He could detect radiation from a candle 19 meters away.

Schuster determined that rotation was due to pressure differences on the two sides of the vanes. Reynolds measured this to be one of the order of one-thousandth of the gas pressure in the bulb. He also proved in 1876 that slip of gas over the surface of the vane must play an important part in the action of the radiometer. This relationship was expressed mathematically (Germany, 1922) by Edith Einstein: The normal component of pressure is proportional to the gas pressure and to the square of the rate of flow through the gas.

W. W. Coblentz, Bureau of Standards, 1906, proved: The deflections of a sensitive galvanometer connected to such a vacuum ther mo-couple are proportional to the radiant energy per second falling upon the receiver.

Dr. L. D. Huff, Head of Physics Department at this college, has told me that one of the latest and most comprehensive books in this and related fields is Dr. Langmuir's High Vacuum Technique (General Electric, Schnectady).

6—10:15-10:30

Integral Remainder Form for the Hermite Interpolation Formula

ALFRED T. HIND, JR. (Introduced by TOMLINSON FORT), University of Georgia

The formulas which are used for forming the Hermite interpolation polynomial, $F(x)$, for a function, $f(x)$, possessing 2 m continuous derivatives were given. Then Taylor's formulas for $f(x)$ with remainer in integral form were taken and from it an integral form for the remainder, $f(x) - F(x)$, was obtained.

15 Minutes

7—10:30-10:45

On Tauberian Theorems for Cesaro Summability

GERHARD N. WOLLAN (Introduced by TOMLINSON FORT), University of Georgia

A discussion of some Tauberian theorems for Cesaro summability of divergent simple series and their extension to divergent double series.

15 Minutes

8—10:45-11:00

Coordination of Mathematics and Engineering

W. VINCENT NEISIUS, Georgia Institute of Technology

A discussion of some of the needs of improved coordination in engineering schools and a description of a program of coordination which is being attempted at the Georgia Institute of Technology.

15 Minutes

9—11:00-11:15

Partition of Space

HENRY A. ROBINSON, Agnes Scott College

This paper considers as an application of calculus of finite differences certain problems of the partition of space. In d-space, let $S(n,d,k,j)$ be the maximum number of d-cells formed by the partitioning of a simply connected euclidean region R_d by n hyperplanes of d-1 dimensional subspaces, each hyperplane intersecting each other in k d-2 cells within R_d and no d+1 or more hyperplanes passing through a d-2 cell, and j being zero if the hyperplanes do not intersect the boundary or 1 if they do. Now

$$S(n,d,k,j) = \sum_{i=0}^{a} \binom{n}{1} + (1-j)\binom{n-1}{d} + (k-2+j)\binom{n}{d}$$

Formulas covering certain hybrid cases are derived.

10 Minutes